## REMARKS

Claims 1-18, all the claims pending in the application, stand rejected on prior art grounds. Claims 1, 4-6, 10, 13, 15, and 17 are amended herein. Applicants respectfully traverse these rejections based on the following discussion.

### I. The Prior Art Rejections

Claims 10-17 stand rejected under 35 U.S.C. §102(b) as being anticipated by Mandl (U.S. Patent No. 6,597,371). Claims 1-9 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Yamazaki, et al. (U.S. Patent No. 6,335,716), hereinafter referred to as Yamazaki, in view of Mandl. Claim 18 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Mandl, in view of Yamazaki. Applicants respectfully traverse these rejections based on the following discussion.

Mandl teaches a method and apparatus for digitally driving an addressable pixel display by modulating each pixel e.g., on or off, in short time pulses. A preferred embodiment responds to N-bit pixel words derived from a source digital file at a rate F1 for producing M-bit data streams at a rate F2 where N>M and F1<F2. Each data stream is preferably produced by an oversampling data modulator employing a delta-sigma implementation.

Yamazaki teaches a semiconductor display device correcting system including a control circuit for carrying out gamma correction of a picture signal supplied from the outside and a nonvolatile memory for storing data for gamma correction. The data for gamma correction is prepared for each semiconductor display device, so that excellent gradation display can be made.

However, the amended claimed invention contains features, which are patentably distinguishable from the prior art references of record. Specifically, amended independent

claims 1, 4-6, 13, 15, and 17 recite, in part, "...wherein said pulse strings comprise a frequency characteristic having a trapezoidal shape corresponding to said digital input data." Similarly, amended independent claim 10 recites, in part, "...wherein said reference pulses comprise a frequency characteristic having a trapezoidal shape corresponding to said n-bit digital input data." These features are simply not taught or suggested in the cited prior art references. As described on page 11, second paragraph, and page 15, third paragraph (extending to page 16) of the specification as originally filed, and as illustrated in Fig. 8, the relationship between the digital input data and the pulse string frequency for the pulse generation circuit is embodied with a frequency characteristic having a trapezoidal shape.

This aspect of the claimed invention is quite advantageous in that the frequency of the pulse string is kept constant for the digital input data within a range of 128 to 384, for example. In this way, using pulse generation circuit 21 of the claimed invention, the maximum frequency of the pulse string is able to be reduced to half. When generating an analog output voltage in this range, the number of switching times for voltage conversion circuits 24 to drive integration circuit 25 is able to be kept constant. Accordingly, the adverse effect on the analog output voltage due to switching is maintained uniformly, thus the linearity is expected to be improved. When driving the liquid crystal display at 5 V, this range, that is, 128 to 384 of digital input data corresponds to 1.25V to 3.75V of analog output voltage whose dynamic range is between 0V and 5V. This range corresponds to a portion where the liquid crystal display changes most steeply, and which is most sensitive, that is, the most important voltage range to drive the liquid crystal display. Therefore, it is clear that a great effect is brought about by the claimed invention.

Moreover, for the same reasons described above, it is preferable that the pulse generation circuit for liquid crystal display DACs generates pulses using a method in which the number of

switching times does not vary in the midsection of the digital input data, in consideration of linearity after the pulse generation.

Furthermore, the frequency is reduced for a predetermined range of digital input data around its medium value to keep the number of switching times constant, thereby reducing the power consumption of a PDM type DAC for the liquid crystal display and improving linearity of output voltage. As a result, linearity of analog output voltage is improved, which allows to reduce deviation of reference voltages for gamma correction between each of the source driver ICs 20. As such, compared with typical PDM type DACs, wasted power consumption is reduced, thereby reducing power consumption of LCD panels advantageously.

Clearly, neither Mandl nor Yamazaki teach or suggest pulse strings comprising a frequency characteristic having a trapezoidal shape corresponding to digital input data. In fact, neither Mandl nor Yamazaki are focused on reducing power consumption of LCD panels. Mandl refers only to producing flicker free displays, and it appears that the Office Action is equating "flicker free" to a non-peak local frequency of switching times for pulse strings per time unit as provided by the claimed invention. However, there is no teaching or suggestion in Mandl that producing such a flicker free display would yield decrease LCD panel power consumption. In fact, Mandl does not even refer to power consumption at all, thus if it were an aspect of the flicker free display, then surely it would have been mentioned. Likewise, there is no mention in Yamazaki of decreased power consumption with regard to its display device correcting system. Therefore, neither Mandl nor Yamazaki teach or suggest the claimed invention.

The claimed invention's pulse string's frequency characteristic being trapezoidal in shape relates to this decreased power consumption of the LCD panels, as described above, by keeping

the number of switching times (frequency) for pulse strings per time unit constant for a predetermined range of the digital input data and by allowing the number of switching times to increase/decrease prior to/after this predetermined range. Accordingly, as the digital input data increases within a range of 0 to 128, for example, the frequency of the pulse string increases monotonously, and for the digital input data ranging from 384 to 511, for example, as the input data increases, the frequency of the pulse string decreases monotonously. Again, for the digital input data ranging from 128-384 (predetermined range), the frequency of the pulse string is constant, thereby yielding a trapezoidal shape over the entire range (0-511) of the digital input data, which is a feature not taught or suggested in the cited prior art references of record.

Moreover, the Applicants note that all claims are properly supported in the specification and accompanying drawings, and no new matter is being added. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

## II. Formal Matters and Conclusion

With respect to the rejections to the claims, the claims have been amended, above, to overcome these rejections. Moreover, the Applicants respectfully submit that independent claims 1, 4-6, 10, 13, 15, and 17 are patentable over the prior art of record. Furthermore, dependent claims 2-3, 7-9, 11-12, 14, 16, and 18 are similarly patentable, not only by virtue of their dependency from a patentable independent claim, but also by virtue of the additional features of the invention they define. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

In view of the foregoing, Applicants submit that claims 1-18, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in

condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 50-0510.

Respectfully submitted,

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